National Institute of Environmental Health Sciences

Climate change and health: Indoor heat exposure in vulnerable populations

Author(s): White-Newsome JL, Sanchez BN, Jolliet O, Zhang Z, Parker EA, Timothy Dvonch J, O'Neill MS

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Abstract:

INTRODUCTION: Climate change is increasing the frequency of heat waves and hot weather in many urban environments. Older people are more vulnerable to heat exposure but spend most of their time indoors. Few published studies have addressed indoor heat exposure in residences occupied by an elderly population. The purpose of this study is to explore the relationship between outdoor and indoor temperatures in homes occupied by the elderly and determine other predictors of indoor temperature. MATERIALS and METHODS: We collected hourly indoor temperature measurements of 30 different homes; outdoor temperature, dewpoint temperature, and solar radiation data during summer 2009 in Detroit, MI. We used mixed linear regression to model indoor temperatures' responsiveness to weather, housing and environmental characteristics, and evaluated our ability to predict indoor heat exposures based on outdoor conditions. RESULTS: Average maximum indoor temperature for all locations was 34.85 degrees C, 13.8 degrees C higher than average maximum outdoor temperature. Indoor temperatures of single family homes constructed of vinyl paneling or wood siding were more sensitive than brick homes to outdoor temperature changes and internal heat gains. Outdoor temperature, solar radiation, and dewpoint temperature predicted 38% of the variability of indoor temperatures. CONCLUSIONS: Indoor exposures to heat in Detroit exceed the comfort range among elderly occupants, and can be predicted using outdoor temperatures, characteristics of the housing stock and surroundings to improve heat exposure assessment for epidemiological investigations. Weatherizing homes and modifying home surroundings could mitigate indoor heat exposure among the elderly.

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Resource Description

Exposure :

weather or climate related pathway by which climate change affects health

Temperature

Temperature: Extreme Heat

Geographic Feature:

resource focuses on specific type of geography

Urban

Geographic Location: ☑

resource focuses on specific location

United States

Health Impact: ☑

specification of health effect or disease related to climate change exposure

Injury, Other Health Impact

Other Health Impact: heat related illness

Mitigation/Adaptation: ☑

mitigation or adaptation strategy is a focus of resource

Adaptation

Population of Concern: A focus of content

Population of Concern: ☑

populations at particular risk or vulnerability to climate change impacts

Elderly

Resource Type: ☑

format or standard characteristic of resource

Research Article

Resilience: ☑

capacity of an individual, community, or institution to dynamically and effectively respond or adapt to shifting climate impact circumstances while continuing to function

A focus of content

Timescale: ☑

time period studied

Time Scale Unspecified

Vulnerability/Impact Assessment: ☑

resource focus on process of identifying, quantifying, and prioritizing vulnerabilities in a system

A focus of content